Mid-chain diols and keto-ols as potential paleoenvironmental tracers for the California continental margin during the late Quaternary

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Investigating marine sediments from the southwest African continental margin Versteegh et al. (2000) recently found indications that the proportions of individual diol and keto-ol isomers with different positions of the mid-chain functional group seem to trace changes in the sea surface water masses. North of the Angola-Benguela front, warmer water is transported southward by the Angola current and freshwater is supplied by the Kongo river reducing the overall salinity of the water masses. South of the front, colder water is transported northward by the Benguela current and there is permanent upwelling off Namibia. The Angola-Benguela front seems to act as a barrier concerning the diol and keto-ol isomer ratios. North of the front, higher proportions of the 1,15-C_{30}-diol and keto-ol and south of the front higher proportions of the 1,13-C_{30}-diol and keto-ol were detected. The 1,14-C_{30}-diol did not show a distinct trend.

In our study we analyzed marine sediments from three Ocean Drilling Program (ODP) sites, representing a south-north transect along the California continental margin (ODP Leg 167) and covering a time period of the last 160 kyr, for their diol and keto-ol isomer compositions. Alkenone-derived paleo-sea surface temperatures (Mangelsdorf et al., 2000) revealed a clear change of the water mass characteristics in the transition from the open California continental margin to the Southern California Bight. In this area, the southward California Current transporting cold subartic water with low salinity merges with the northward Southern California Countercurrent transporting warmer water.

In the sediments of the California continental margin, mid-chain diols and keto-ols with variable positions of the mid-chain functional group and even carbon numbers from C_{26} to C_{30} and C_{30} to $C_{32,}$ respectively, occur in significant amounts. C_{30} diols and keto-ols in the sediments north of the transition zone (cold waters) are dominated by the 1,13-isomers, whereas south of this zone (warmer water) these compounds are dominated by the 1,15-isomers. Both the 1,14-C_{30}-diol and keto-ol proportions remain relatively constant along the transect. These results from the California continental margin (North Pacific) coincide remarkably well with the trends observed in the southeast Atlantic (Versteegh et al., 2000) outlining the potential of these biomarkers to trace paleoenvironmental conditions in different global settings.

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Stalagmites indicate a link between Earth´s magnetic field and climate during the past 200,000 years

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The growth of stalagmites in Caves in Oman and in the Central Alps stands for extremely warm climate. At both localities we observe growth of stalagmites coincident with the five periods of enhanced Earth's magnetic field during the last 200,000 years. Furthermore, precise dating of speleothems in the Central Alps shows that growth begins at 135 ±1.2 kyr B.P., about 8 kyr previous to the maximum of June insolation at 65°N, corroborating recent results obtained from sediment cores off Bahamas (HENDERSON and SLOWEY, 2000) and from a terrace of Barbados (GALLUP, 2002). Together they make a strong argument for a relationship between the magnetic field and climate. This is of special relevance for the ongoing discussion on a possible coupling of climate with cosmic rays (MARSH, 2000). If the intensity of the Earth's magnetic field responds to changes of orbital parameters, as was suggested 20 years ago and which is still under discussion (YAMAZAKI, 2002), then the Earth´s magnetic field could be an additional forcing for climate.

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